

REMARKS

Claims 1-4, 6-12, 14-19, 21-23 are all the claims pending in the Application. Claims 21-23 are withdrawn. By this Amendment, Applicants cancel claims 21-23 without prejudice or disclaimer.

Preliminary Matters

By this Amendment, Applicants amend claims 1 and 8 to clarify their language.

Claim Rejections - 35 U.S.C. § 103

Claims 1-4, 6, 7, 10, 11, and 16-18

Claims 1-4, 6, 7, 10, 11, and 16-18 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Meynen in view of Besser. Applicants respectfully traverse the grounds of rejection.

The claimed invention comprises at least one trench and a via hole, such trench and via hole being formed in an insulation structure including at least one porous layer. The inner walls of the trench and via hole are coated with an insulation barrier layer with an organic substance, such that a side surface of each is covered.

The Examiner properly concedes that Meynen does not teach the specific layers recited in claim 1, but asserts that Besser cures this deficiency. Applicants submit that, contrary to the Examiner's assertions, Besser does not teach or suggest that the organic substance of an insulation barrier layer has a higher carbon content than the other layers. Besser teaches the use of sidewall barrier materials which contain carbon (see Besser [0051]), but the carbon content of sidewall barrier material is not always larger than that of other films. For example, general Black Diamond® composition is approximately Si:O:C = 0.3:0.3:0.3. On the other hand, SiC film, which can be used for the other films (see at least Meynen paragraphs [0033]-[0040]), is

Si:C = 0.5:0.5. Accordingly, carbon content of SiC film is larger than that of the sidewall barrier material. Therefore, even if, *arguendo*, the Meynen and Besser references were arbitrarily combined in the manner suggested by the Examiner, Applicants submit that it would be impossible to achieve such a structure wherein carbon content of organic barrier layer is larger than that of first, second and fourth films.

Applicants further submit that the cited art teaches a different structure from the claimed invention. In the Meynen structure, a barrier layer is formed on the side of a first insulation film. See Meynen FIGS. 1 and 2. However, such film is not formed in the present application. In the claimed invention, a barrier layer is formed without opening the first insulation film. This inhibits the oxidation of the underlying copper. Contrary to Meynen, a barrier layer is not formed on the side of a first insulation film. Accordingly, Applicants submit that Meynen teaches away from the claimed structure. Applicants submit that Besser does not cure this deficiency.

In view of the above, Applicants submit that claim 1 is patentable over the cited art. Applicants further submit that claims 2-4, 6, 7, 10, 11, and 16-18 are patentable at least by virtue of their respective dependencies.

Claim 12

Claim 12 is rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Meynen in view of Besser as applied to claim 1 above, and further in view of Yang (U.S. Patent. 7,132,363). Applicants respectfully traverse the grounds of rejection.

Applicants submit that Yang does not cure the above-noted deficiencies in Meynen and Besser. Hence, Applicants submit that claim 12 is patentable over the cited art at least by virtue of its dependency.

Claim 19

Claim 19 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Meynen in view of Kim (U.S. Pub. 2002/0185671). Applicants respectfully traverse the grounds of rejection.

Applicants submit that the cited art does not teach or suggest the features of claim 19. Specifically, Applicants submit that the cited art does not teach at least using a first and second insulation film in direct contact with one another and made of the same material, or the associated advantages of this structure. Though the second insulation film is generally used for protecting a porous film during a Cu-CMP (Chemical Mechanical Polishing) process, the process damages the surface of the second insulation film. The damage becomes a leakage current path between wirings and is known to cause degradation of insulation reliability. In contrast to this prior art arrangement, claim 19 recites using the same material for a first insulation film and a second insulation film, the first insulation film being formed on the second insulation film, i.e. in direct contact with it. The present application discloses that with this structure, the damage made on the surface of the second insulation film is repaired at the time of forming the first insulation film, and insulation reliability is improved (refer at least to FIGS. 13-14).

The cited art does not explicitly teach using the same material for the first and second insulation films, only that it teaches selecting materials from the same group. See Meynen paragraphs [0035]-[0036]. Applicants submit that insulation reliability cannot be improved only by arbitrarily selecting materials from a group. Applicants further submit that using the same material leads to the unexpected results described above. Applicants submit that the Examiner is improperly applying hindsight reasoning to assert that it would be obvious to make the first and second insulation films from the same material.

Applicants further submit that Kim teaches away from a first insulation film formed on a second insulation film. That is, in Kim, the alleged first insulation film (14) and the alleged second insulation film (18) do not directly contact each other, whereby it is impossible to improve insulation reliability.

In view of the above, Applicants submit that claim 19 is patentable over the cited art.

Allowable Subject Matter

Applicants thank the Examiner for indicating that claims 8-9 and 14-15 are objected to as being dependent upon a rejected base claim but would be allowable if rewritten into independent form including all the limitations of the base claim and any intervening claims. Applicants respectfully request that such rewriting be held in abeyance.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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